THE MAC Flyer

APRIL 1984

Battle with the Birds...page 3

THE MAC Flyer

For Greater Safety in MAC Air Operations

APRIL 1984 MACRP 127-5 VOL XXXI NO. 4

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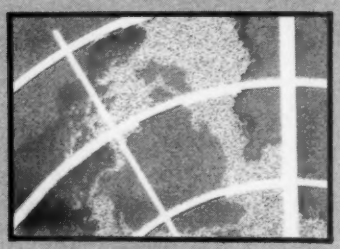

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Battle with the Birds

The Bird/Aircraft Strike Hazard Team, or BASH team, based at Tyndall AFB, Florida, is invariably asked about bird migration and its "impact" on the bird strike rate for the Air Force. During BASH team assistance visits, wing safety officers often indicate that aircrews are briefed on the increased risk of hitting our feathered friends during the fall and spring migrations. Although Air Force aircraft do experience more bird strikes during the migration seasons, many serious strikes have occurred during the non-migration times of the year.

As everyone knows, most birds migrate south for the winter and north for the summer. In the interest of efficient airspace use, nature has ordained that not all birds migrate at the same time of the year. Nature doesn't include metal birds in that schedule, however. Birds also don't file flight plans, at least not that we know of. So, looking at these facts and past experiences, aircraft are vulnerable to bird strikes day or night, anytime of the year.

To illustrate that point, hawks and eagles migrate during the day and are usually observed in large numbers along many prominent lookouts. Coastlines and mountain ridges, for instance, make excellent vantage points because of the favorable updrafts which make flying more efficient, for the birds that is. But most small birds migrate at night stopping to feed and rest during the day. Then, there are certain feathered fliers who don't care when they fly, (much like MAC aircrews), day or night.

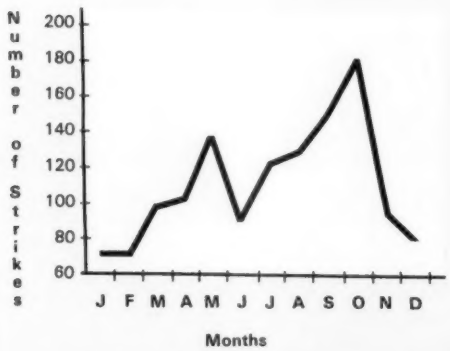
Now, while those birds are difficult enough to see during daylight hours because of their natural camouflage, sighting them at night or in low-visibility conditions is nearly impossible. If by now you're just about ready to throw in your white silk scarf and find yourself a good, reliable bicycle, hang on to your stick and rudder. All is not lost! Thanks to a little invention developed by the British during World War II, we have the ability to see things which go "bump in the night"—radar!

Although radar has been used for years to determine bird movement patterns (both migratory and local), the concept of bird avoidance requires a detection system that possesses a high probability of seeing all birds large enough to cause significant damage to an aircraft. Many radars now in use are capable of detecting birds, but because they are in use by the air traffic control or air defense communities, the bird targets are tuned out as "clutter." Avoidance of known flight paths can lower the probability of strikes, but when larger birds gather around a terminal area, the likelihood of a catastrophic strike increases as does the need for some real-time avoidance information.

TAC and SAC have historically been interested in actions that would reduce bird strikes. That's understandable since the "name of the game" for those people is low-level flying, and when you're flying at 400 to 500 knots at tree-top heights, you're going to take bird strikes. But MAC's interest isn't as great since cargo aircraft don't hit birds, and trash-haulers don't fly low-level, right? Guess again! MAC aircraft reported bird strikes at the same rate as any other command, plus we also fly low-level missions. MAC's statistics also show that the number of bird strikes suffered by this command has been rising slowly but steadily since 1978.

MAC's main battleground in trying to deal with the birdstrike problem is Dover AFB, Delaware. Virtually surrounded by wildlife refuges, Dover has already experienced an increased bird strike hazard during the fall and spring migration periods. In the past 10 years, however, milder winters and a change in the feeding habits of the snow goose have resulted in dramatic increases in the number of water fowl wintering on those Delaware refuges. For example, in January 1983, a C-5 and a flock of snow geese found themselves occupying the same piece of airspace at the same time.

While lifting off runway 01 at Dover for a fully-loaded channel flight, the giant transport encountered a flock of at least 60 snow geese with some hair-raising results—failed engines, secondary damage to other engines, emergency fuel dumping at low altitude, etc. In all, superior airmanship and a measure of good fortune resulted in a safe recovery



Average Monthly Bird Strikes—All Aircraft Types 1980-1982

MAC Reportable Bird Strikes
(over $1,000)
1978-1983

1978	32
1979	35
1980	36
1981	39
1982	44
1983	50

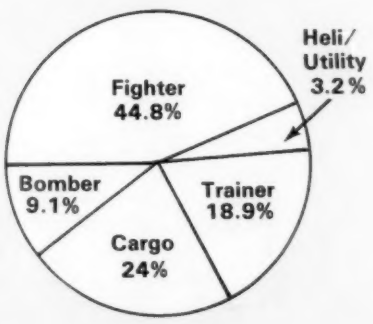
for this particular crew and plane. Some of the geese didn't fare as well, but the incident brought to light one very important fact—snow geese and C-5s in the same airspace just didn't mix!

So, at CINCMAC's request, an Air Force Systems Command team led by the radar experts from the Rome Air Development Center (RADC) met at Dover to look over the problem. These experts, along with representatives from MAC, BASH and local and national wildlife organizations, concluded that the best short-term solution would be to install a small, mobile radar unit like the Army's TPN-18A. RADC's efforts were successful. With the outstanding cooperation of the Army, a radar and the people needed to operate it were in place a short time later, and they stayed there until the geese departed the Delaware countryside in April.

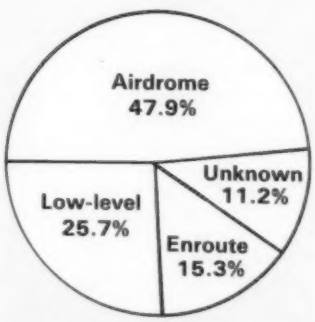
The next step was to determine what off-the-shelf resources were available for future use. Under the leadership of MAC's systems development folks (HQ MAC/XPQS), and RADC's radar specialists, MAC/DC's air traffic controllers and the 436 MAW's ops people met throughout the summer of 1983 systematically analyzing the options at hand. Testing various radar systems, they determined that the newly installed GPN-20 air traffic control radar was superior to all other systems in detecting bird activity.

On 9 November, the "bird watch" function was transferred to the Dover AFB radar approach control (RAPCON) facility. Now, a dedicated radar indicator within the RAPCON is providing bird advisories through the air traffic control system to all aircraft arriving and departing Dover. In addition, RAPCON passes advisories concerning general bird intensities to the Dover command post for decisions concerning the safety of local flying. (*Editor's Note:* The Dover command post uses a three-color system to alert all aircraft in the Dover area. "Green" means no bird activity. "Yellow" indicates some bird activity, but no flying hazard exists. "Red" means a significant bird hazard exists and there will be no local flying. In addition, during a "red" condition all departing aircraft must contact the command post for permission to start engines.) While it's difficult to determine the effectiveness of the "bird watch" function, it certainly has provided a margin of safety for all aircraft operations in the Dover AFB area, as well as some needed peace of mind for the Dover fliers.

Advances in radar technology will continue to improve our ability to detect large concentrations of birds. But there's still much that needs to be done before we can safely share our airspace with nature's feathered creatures.



Bird Strikes by Aircraft Group 1980-1982



Bird Strikes by Phase of Flight Major Categories for 1980-1982

Thanks to Paul Desaulniers, Air Traffic Control Specialist, HQ MAC/DCF; and Capt Bob Kull, HQ AFESC/DEVN, BASH Team, Tyndall AFB, Florida for their assistance in preparing this article.

1983 Mishap Statistics

Best in the Air Force in 1983 and Best in MAC History

What a difference a year makes! Last April we had the grim task of reporting that MAC's 1982 DOD Class-A flight mishap rate of 1.3 was the worst since 1978. But in the past 12 months that has all changed—and changed for the better.

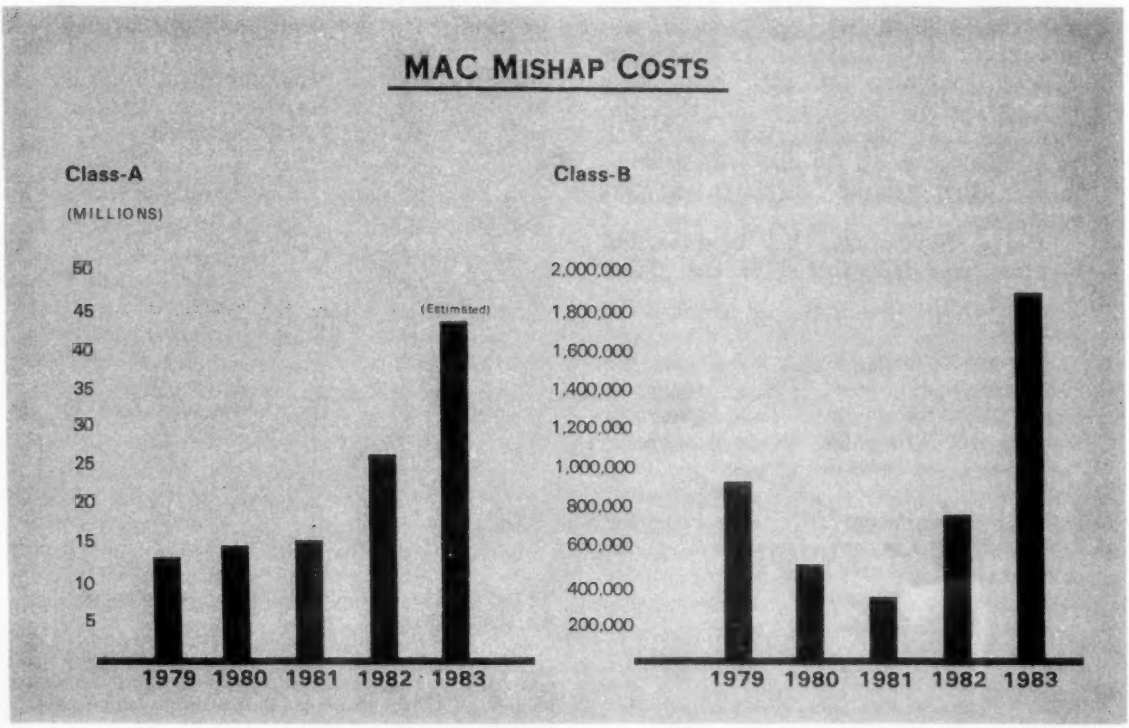
We at *TMF* take great pride in announcing that MAC's 1983 Class-A flight mishap rate of .40 is the lowest in the command's history and the lowest among all Air Force MAJCOMS for 1983. The all-time low rate was based on three Class-A flight mishaps in over 739,904 hours of flying time, and easily eclipsed the 1983 Air Force rate of 1.73.

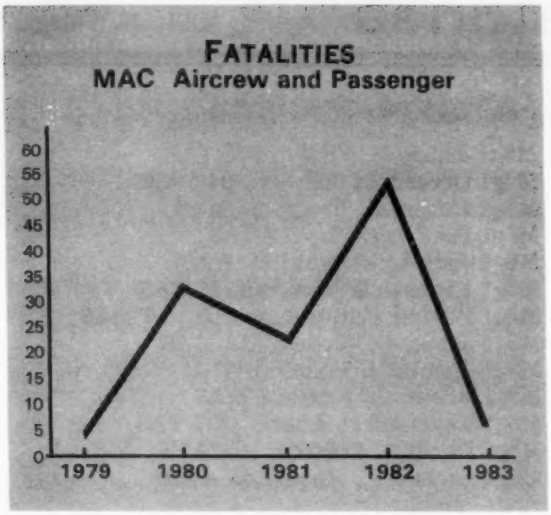
Equally significant was the fact that there were no C-141 or helicopter Class-A flight mishaps during 1983. This is a notable improvement over 1982's record of one C-141 and five helicopter Class-A mishaps

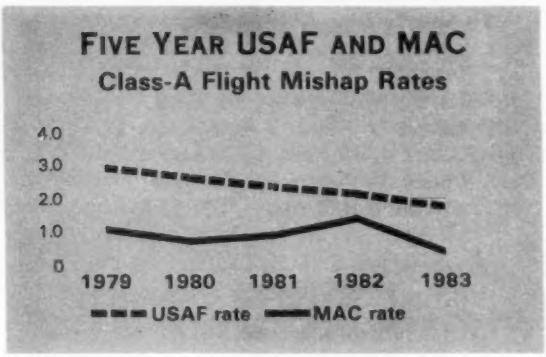
But MAC's DOD Class-B flight mishap rate was not as encouraging. During 1983, MAC was charged with six Class-B mishaps, up from four in 1982. MAC's 1983 Class-B mishap rate of 0.8 doubled the 1982 rate of 0.4 and was significantly above the Air Force average rate of 0.5 for 1983.

On a more positive note, though, MAC greatly reduced the number of aircrew and passenger fatalities. During 1983, only five crewmembers and one passenger were killed in aircraft mishaps. By comparison, 54 persons were killed in MAC aircraft mishaps in 1982.

The cost of mishaps increased dramatically in 1983 when compared with the previous year. For example, the nine Class-A flight mishaps in 1982 cost approximately $26,000,000. However, total costs for the three 1983 Class-A mishaps will probably exceed $44,000,000. (Repair costs for two







mishaps haven't yet been finalized.)

Class-B flight mishap costs also rose substantially in 1983. The four Class-B mishaps in 1982 cost $752,000. However, the six 1983 Class-B mishaps cost over $1,878,000.

Class-A Mishap Briefs

- A C-130 crashed after attempting a simulated heavy equipment airdrop, killing five crewmembers and one passenger. The total cost of the mishap was $6,100,000.
- A C-5 landed short of the runway following an instrument approach. There were no injuries, but the estimated repair costs are approximately $37,000,000.
- A C-5 landed with the landing gear retracted during a local proficiency sortie. Again, there were no injuries, but repair costs are estimated to exceed $1,000,000, with final costs still to be determined.

Class-B Mishap Briefs

- A C-141 landed gear up during a training mission. Damages exceeded $459,000.
- A C-5 suffered multiple bird strikes from snow geese. The cost of the mishap was $280,000.
- Another C-5 also encountered a flock of snow geese and sustained multiple bird strikes. Damages exceeded $385,000.
- A C-141 main landing gear separated from the aircraft inflight. The aircraft suffered $181,000 in damages.
- An HH-53 was taxiing when its rotor blades struck the blades of another, parked, HH-53, damaging both. Additionally, there was shrapnel damage to a KC-135. The cost of the damages exceeded $349,000.
- Finally, a C-130 landed with one main landing gear not fully extended, causing $224,000 damage to the aircraft.

Air Reserve Forces

MAC-gained Air Reserve Forces had no Class-A or Class-B flight mishaps during 1983.

1983 In Review

Overall, MAC's 1983 mishap record was an extraordinary success, especially in the area of Class-A mishap prevention efforts. But as the statistics clearly show, there is always more we can do to lower the numbers of Class-B mishaps and to reduce our overall mishap costs.

The solution is known, time-tested and workable. We have to think, act and emphasize safety in everything we do, no matter what job we're performing. Couple that with a total commitment to safety on the parts of aircrews, ground personnel, supervisors and commanders, and we *can* improve on a very good 1983 record. ★

1983 MAJCOM FLIGHT MISHAP RATES

MAJCOM	Class-A	Class-B
ATC	0.8	0.2
MAC	0.4	0.8
PACAF	1.1	2.1
SAC	0.6	0.3
TAC	3.7	0.7
USAFE	3.9	0.4
USAF	1.73	0.6

Flying-Hour Milestones

10,000

Lt Col Robert K. Kjellberg, 3 MAS
SMSgt Albert J. Raymond, 312 MAS

5,000

Col Thomas P. Bradley, 1 SOW
Col Hugh L. Cox, III., 2 AD/CC
Col Hugh L. Hunter, 1 SOW/CC
Col Robert A. McGlohon, 1 SOW
Col Hanson L. Scott, 314 TAW/CV
Col Raymond Turczynski, Jr., 2 AD
Lt Col Thomas C. Adamchak, 337 TAS
Lt Col David A. Holland, 16 TATS
Maj Paul H. Barrett, Jr., 301 MAS
Maj Wayne R. Bevan, 312 MAS
Maj Francis C. Harrington, Jr., 2 AD
Maj William R. Helmer, 16 TATS
Maj William D. Jenkins, 312 MAS
Maj Keith Kester, 911 TAG
Maj Howard K. Murphy, 312 MAS
Maj Allan L. Peck, 61 TAS
Maj Willis C. Woody, Jr., 55 ARRS
Sq Leader Allan T. King, 61 TAS
Capt Eric H. Lenz, 7 MAS
Capt William R. Tefteller, 301 MAS
CMSgt William P. Mattson, 86 MAS
SMSgt Charles R. Bailey, 375 AAW
SMSgt Francis R. Belliveau, 21 AF
SMSgt William V. Knox, 16 TATS
SMSgt Roger W. Nelson, 20 MAS
SMSgt Carl D. Parker, 86 MAS
SMSgt David Thurstenson, 16 TATS
SMSgt Irving H. Torchinsky, 16 TATS
MSgt Thomas M. Aldrich, 55 ARRS
MSgt Harold W. Anthony, 7 MAS
MSgt James W. Bickel, 773 TAS
MSgt Gerard A. Boisvert, 94 TAW
MSgt Robert A. Bragg, 57 MAS
MSgt Fred J. Cech, 700 TAS
MSgt Jack L. Coggins, 57 MAS
MSgt Kenneth W. Dorman, 37 TAS
MSgt Fenton H. Hutchison, Jr., 57 MAS
MSgt James D. Jensen, 312 MAS
MSgt Thomas L. Johnson, 57 MAS
MSgt Robert E. Kruse, 7 MAS
MSgt Raymond N. Laurin, 337 TAS
MSgt David A. Presson, 16 TATS
MSgt Michael E. Recek, 55 ARRS
MSgt Abelino Sauceda, 774 TAS
MSgt Luther B. Williams, 16 TATS
TSgt Dean T. Brady, 20 MAS
TSgt John V. Bricker, Jr., 16 TATS
TSgt Robert D. Jarvis, 57 MAS
TSgt Donald M. Paulsen, 76 MAS
TSgt Robert L. Reed, 3 MAS
TSgt Albert J. Walcek, 57 MAS
TSgt Robert V. Schronk, 774 TAS
SSgt Lawrence R. Dotson, 57 MAS

2,500

Lt Col Leonard G. Knitter, 55 ARRS
Maj Irving E. Greenberg, Det 2, 67 ARRS
Capt Michael J. Hoelzel, 55 ARRS
Capt Joseph R. Mitchell, Jr., 55 ARRS
Capt Robert J. Wisnom, Det 15, 39 ARRW
MSgt Harry H. Cash, 1551 FTS
MSgt Peter S. Harding, 55 ARRS
TSgt Donald A. Appleby, 55 ARRS

Ranks and units are those at time of award. See MACR 900-3 for details on how to apply for your own milestone award.

The tale of the pilot who broke...

The Law of Limits

by Capt. Mark E. Stearns
37th ARRS Stan-Eval
Francis E. Warren AFB, Wyoming

It was a beautiful day for flying. The weather was perfect, the scenery was fantastic and the aircraft was flying great. I had just dropped off my passengers and had about an hour to kill until they'd be ready to return. Great! A chance to be alone with the birds in a vast blue sky. I couldn't wait to get up in the air and practice.

A few short minutes later, I'd done everything I could think of to improve my proficiency and still had 20 minutes left to kill. My mind drifted to the war stories I had heard earlier and I decided to try a new maneuver that sounded interesting. I thought it through a couple of times, decided it was possible and felt I could handle it. Well, here goes

Honorable Mention, 1983 MAC Flying Safety Writing Contest

nothing, I thought. About halfway through the maneuver I started getting a little nervous. I didn't feel comfortable and suddenly realized I had bitten off a little more than I could chew. Luckily, the aircraft straightened out and soon I was back where I belonged, straight and level, and slightly embarrassed. I thought through the maneuver again in an attempt to discover what I'd done wrong. Suddenly, I realized with a queasy feeling that I'd actually lost control. Fortunately, the aircraft let me get it back.

Suddenly, I realized I had actually lost control!

I was nervous all right. I picked up my passengers, flew home strictly by the book, then went over to the club to contemplate the situation over a couple of beers.

After several sips I felt a little better. I was just about ready to leave when this stranger bought me another drink. Oh well, I guess I should be polite and drink it, I thought. I lifted my glass to him in thanks and he smiled in return. I was halfway through the drink when he walked over and sat next to me. "Pretty close call today, wasn't it?" he asked. I nearly choked on my beer as I looked at him a second time. He seemed like a pleasant fellow, around 40 years old. He wore an old World War I flying jacket complete with flying goggles and helmet hanging from his belt.

"What do you mean?" I asked.

"That maneuver you tried today really shook you up didn't it?"

I acted ignorant since I was sure no one knew of my exploits. He must be talking about something or someone else, I thought. I decided to go along until I could figure out what he was talking about. He described how the maneuver I had botched up should have been accomplished. He talked as if he had been watching my entire flight. By this time he'd captured my full attention. I noticed a twinkle in his eye and felt he wasn't really condemning my actions but wanted to set me straight. I thought over his analysis of the maneuver, but still couldn't figure what went wrong.

"What did I do wrong?" I asked.

"You broke the 'law of limits' today, and were lucky to escape with your skin," he said wisely.

"The law of limits?" I asked.

"Yes, the law of limits."

I was extremely curious by now. I didn't want to appear ignorant, but I had no idea what he was talking about, so I pressed further. "What do you mean by the law of limits? I've never heard about that."

"Well," he said, "everyone has their limit in anything they do. This limit is the imaginary line separating control and uncontrol. Take a ski racer for example. He's very aware of where his 'line' is and tries to stay as close to it as possible. If he crosses this line, he knows that he'll probably fall and lose the race. If he strays too far on the safe side, he knows the other racers will go faster and he'll lose anyway. So he tries to stay as close to this perfect line as possible, hugging the edge. The same is true for everything in life. The only difference is the price you pay."

"How so?"

"Look at it this way. If the skier crosses the line, he loses the race. If a pilot crosses the line, he loses his life."

"OK," I replied with sudden comprehension, "I think I know what you mean. I have to get close to the line in order to improve, but I can't get too close."

His eyes started to twinkle again as he answered, "Well that's part of it. It's not only the person who must obey the

law of limits. Everything must obey." He hit the bar with his fist and then continued. "The machines have to obey, too. If we have a superb race car driver and place him behind the wheel of a car that can't perform up to his skill level, the driver may speed along totally within his limits. But in doing so, he places the car outside of its limit and the result is the same. He loses." He looked to see if I was still with him. "Everything in this universe must obey this law. In fact, most endeavors have several of these limits and to be successful, we must acknowledge all of them. The limits are like a chain and we must cater to the weakest link."

That was a lot to digest at once. But it did seem to make sense. I felt confident I could analyze my limits and know exactly what I could and couldn't do.

He must have read my mind and seemed a little disappointed in my supposed understanding. "It's not as easy as that. If the limits were constant, it would be a snap to find them and stay within their bounds. The problem is that each limit is always changing."

"Great," I said. "Just when I had figured it out, I'm all confused again."

"Look at it this way," he said as patiently as a father talking to his son. "A pilot can fly beautifully one day, but the next day he can barely maintain acceptable standards. His limit has shifted overnight." The confusion was starting to subside. I felt I was again beginning to understand. "The trick is to know all the limits simultaneously and adjust to the changes." Nodding in agreement, I turned to shake his hand. I looked around but couldn't find him. He'd vanished just as mysteriously as he had appeared.

I've thought about what he said time and time again. Over the years I've tried improving my skill within the "law of limits" and found the challenge just as exciting as before. While I've never known all the limits at once, it's a goal I still strive for. Perhaps someday I'll know that final feeling of perfection.

ABOUT THE AUTHOR

After graduation from the Air Force Academy in 1979, Capt Stearns attended undergraduate helicopter training at Ft. Rucker, Alabama. His first operational assignment was with Detachment 10, 37 ARRS, Francis E. Warren AFB, Wyoming, where he served as safety officer, instructor pilot, and flight examiner. From 20 May until 7 Jul 1982, Capt Stearns was a member of the HH-60D source selection team. He is presently chief of standardization evaluation, 37 ARRS.

Airborne Weather Radar

by Captain John Laming
Air Nauru

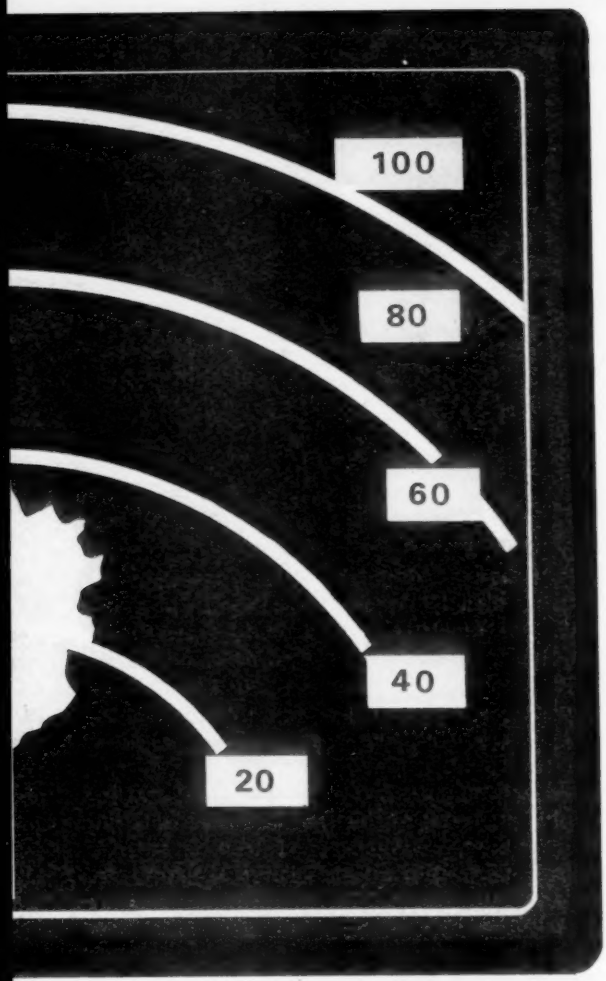
Recently the National Transportation Safety Board (NTSB) released a report on a fatal mishap involving a Swearingen SA-226 Metro which crashed after losing power on both engines during an inadvertent penetration of an intense thunderstorm. Thirteen of the 15 people on board were killed.

The NTSB determined the probable cause of the accident was the crew's continued flight into an area of severe storms, and the resultant precipitation-induced flameout and loss of power. A contributory cause was the precipitation-induced X-Band radar attenuation, which limited the ability of the aircraft weather radar to detect the extent and intensity of the thunderstorms. Here's how the mishap occurred.

The Metro was descending through 8,000 feet when it entered an area of level 2 or greater precipitation and thunderstorm activity. After encountering moderate to severe turbulence and lightning, the crew requested a lower altitude. Shortly after that, the aircraft entered a storm of level 5 or greater and encountered strong horizontal gusts exceeding 70 mph, along with severe wind shear. Both engines flamed out as a result of massive water ingestion.

Approximately 14 seconds after the double flameout, the crew managed to obtain a successful relight on both engines, but by this time the aircraft was descending rapidly in downdrafts exceeding 4100 fpm. The ceiling and visibility at the accident site were less than 100 feet and a quarter mile. The crew probably had almost no visual warning of ground impact. Winds of 100 mph at the accident site and extensive evidence of wind pattern damage to crops revealed the severity of the thunderstorm.

The NTSB stated that when the crew encountered the moderate precipitation, they should have been able to anticipate the developing thunderstorm activity. At this stage, the aircraft was 32 miles from the accident site, and ground based meteorological radar indicated that the precipi-



tation area ahead of the aircraft was increasing in intensity. However, a line of storms extended ahead of the aircraft significantly attenuating the radar returns. Consequently, at 32 miles from the accident site, the crew may not have been able to detect the thunderstorms ahead of them.

Thunderstorms are graded on intensity levels from one to six. Levels 1 (weak) and 2 (moderate) may contain light to moderate turbulence with lightning. In level 3 (strong) storms, severe turbulence is *possible*, with lightning. A level 4 (very strong) storm is *likely* to have severe turbulence as well as lightning. An intense storm, level 5, will have severe turbulence, lightning and strong wind gusts. Hail is likely. Finally, a level 6 (extreme) storm contains severe turbulence, large hail, lightning and extensive wind gusts.

Most airborne weather radars will indicate a contour when the echo reflectivity is about the threshold value of level 3, and a contour should have been present as the Metro approached the leading edge of the thunderstorms. However, precipitation-induced attenuation probably prevented its display on the radar screen until the aircraft was within about a mile of the level 3 area. At this point, the contour area actually shown on the radar would have been small. Once the aircraft actually entered the line of storms, it is unlikely that a contour would have been displayed from that point on until impact. From their radar, the crew would have had no way of knowing the intensity of the weather returns. Additionally, once the aircraft entered the area of level 3 echos, the detection capability of the radar would have been reduced to less than nine miles. As a result, the weather ahead of the aircraft would have been displayed as a bright area, and may have led the crew to believe that they were about to leave the area of precipitation, when in fact they were heading into the most severe portion of the storm.

In 1975, a DC-9 crashed in similar circumstances after losing power on both engines during a thunderstorm, resulting in the deaths of 63 people. In that case, the NTSB determined the cause of the accident was the total loss of thrust from both engines while the aircraft was penetrating an area of severe thunderstorms. The loss of thrust was caused by the ingestion of massive amounts of water and hail which, in combination with throttle movement, induced severe stalling and major damage to the engines. The DC-9 had entered a level 5 or 6 thunderstorm, with tops of over 40,000 feet.

As a result of this DC-9 accident, the NTSB stressed that flight crews must know the uses and limitations of airborne weather radar. The NTSB's report stated, "scientific studies show that the X-band frequency radar is comparatively susceptible to attenuation by water vapor and precipitation. This may be particularly true when water covers the radome. If a pilot fails to consider this limitation, he or she may misinterpret the radar picture, which is a significant reason why airborne weather radar shouldn't be used as a storm penetration aid."

The Swearingen Metro and DC-9 accidents are tragically similar because both had fully serviceable airborne weather radars when they inadvertently penetrated severe thunderstorms. In both cases, the crews were unable to correctly interpret the true nature of the weather ahead because of the inherent limitations of the X-band radars and the fact they were flying in heavy precipitation before penetrating the actual storm cells.

Precipitation attenuation involves a reduction of the energy of a radar beam due to absorption in the atmosphere. Radomes are constructed of materials which pass radar energy with little attenuation, but ice and water increase the attenuation resulting in a radar that appears to have less sensitivity.

This loss of sensitivity is a particular problem when the contour mode is selected and moderate precipitation is present. The contour circuits operate from the strength of returned signals. Returning signals which exceed a predetermined strength threshold are blanked from the display or, if a color display radar is being used, are changed in color. This is the reason that mountains, cities, and even small islands frequently return echos strong enough to contour.

However, if moderate precipitation is present between the radome and a normally contouring thunderstorm cell, the scattering of energy that occurs as a result of reflection from precipitation will cause the thunderstorm image to reduce in intensity. In many instances, there will be insufficient strength in the return to activate a contour signal.

Most operations manuals published by radar manufacturers give some background information on the principles of radar propagation and its limitations, but there is often a tendency to underplay the more serious limitation of radar attenuation in heavy precipitation. Because of this, airborne weather radar should be used only as an *aid* in avoiding severe weather, *not* as a thunderstorm penetration device.

The key to avoiding potentially severe weather, then, is early assessment of the flight path in relation to long range radar returns. For aircraft operating above 25,000 feet, pilots should use the tilt control enabling them to gain some idea of the height of the returns. This should be done when the returns first appear on the radar screen.

Since most radars are stabilized so that the zero setting of the antenna tilt control equates to the horizon, it's prudent to select two or three units of down-tilt in order to assess the relative intensity of returns at lower altitudes. Strong returns from the lower altitude may mean rapidly growing storms that could reach aircraft cruising levels in a short space of time.

When deciding to avoid a significant storm, a general rule of thumb is to keep at least 20 miles away from any marked contour area when at high altitude above the freezing level. Remember, severe turbulence can be experienced up to 20 miles from an intense thunderstorm.

Now a few words on a common-sense attitude to airborne weather radar. Be aware of the correct test pattern display on the screen and check its operation before starting engines. The operator's handbook for the radar will normally depict an illustration of the test pattern.

Before take-off, check the operation of the radar in the normal mode, even though it may not be needed during the departure phase. It is better to taxi back to repair an inoperative radar, rather than take off with one that won't work. Take every opportunity to use the radar in visual conditions, comparing the appearance and types of cloud with the corresponding picture on the radar. On long night flights with nothing showing on the screen, it's also a good practice to occasionally tilt the radar down to ensure ground returns are still being received. Some failures can occur with no apparent change of screen presentation, and it's easy to be lulled into a false sense of radar security.

At night, you might not have to rely exclusively on radar for weather avoidance. With the cockpit and instrument panel lights dimmed, indications of distant storm tops are often clearly visible even in moonlight, but aren't visible on the radar screen. Lightning flashes can be seen for 100 miles or more.

Finally, remember that weather briefings are only forecasts. The final responsibility for avoiding inadvertent penetration of a thunderstorm rests with the aircraft commander.

—Adapted from *AIRCRAFT*, December 1981, by permission of the author.

Dropped Objects

Lost in the Gulf

A C-130E was flying over the Gulf of Mexico when the left HF antenna broke and began flailing the aircraft. Upon landing, the crew discovered approximately 40 feet of antenna wire and the strain insulator were missing.

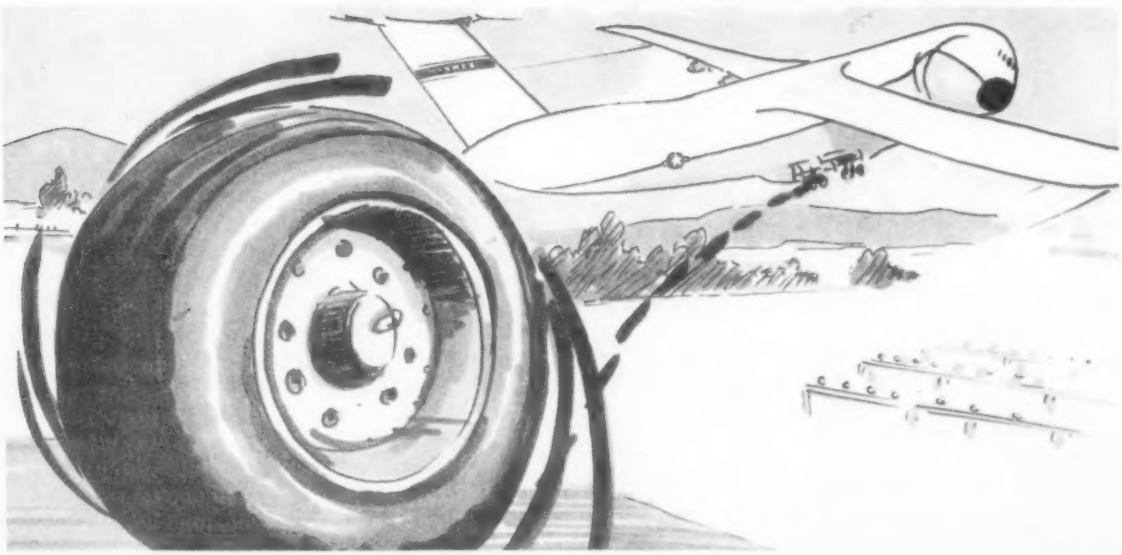
Popped Plexiglass

An enroute TH-1F pilot was readjusting his seat's position, something we all do occasionally for comfort's sake. What was unusual was the result. In readjusting his seat, the pilot's elbow struck the door window and broke out a piece of plexiglass approximately 12 x 8.5 inches wide. Oops!

Green Light

The Galaxy crew's touch-and-go was routine—with one exception, that is. It seems one of the right aft-main-landing-gear wheel and tire assemblies departed the aircraft over the field. Investigators discovered that the lock ring and wheel retainer nut were not properly installed during the last tire installation.

As these 1983 dropped object examples show, MAC does indeed experience objects falling from aircraft during flight. During 1983, in fact, we had 360 dropped objects with a loss of over $460,000. Of the 360 dropped objects, 207 (58 percent) were due to



materiel failure while 139 (39 percent) were due to personnel error. The remaining 14 dropped objects were from other causes.

The most common objects dropped from the C-5 in 1983 were engine blow out doors and crash data position indicator recorders.

1983 Dropped Object Summary

(Rates Per 1,000 Departures)

Aircraft	Total Dropped Objects	1983 Rate
C-5	56	4.69
C-9	1	0.04
CT-39	4	0.10
C-130	95	1.50
C-135	14	9.83
C-140	3	1.07
C-141	150	1.78
H-1	11	0.42
H-3	6	0.56
HH-53	14	4.12
H-60	6	3.28
Totals	360	1.34

Aircraft not listed above had no dropped objects in 1983.

MAC's C-130s most frequently discarded HF antennas, landing lights and fuel caps. Fire access panels, taxi lights, and single point refueling caps headed the dropped objects list for our C-141s. MAC's fleet of HH-53s most often lost tail rotor fairings and ramp windows.

"MAC is heavily involved in combatting dropped objects," according to Capt. Mike Gibson, the Headquarters MAC dropped object program manager. "We've established a command dropped object prevention program under MAC Regulation 66-7. The program's goal is to prevent objects from unintentionally falling from the sky during flight, including takeoff and landing." Even dropped objects falling off planes during taxi are included within the scope of this program. The tools used in dropped object prevention include a system of reports, investigations, and materiel and procedural improvements.

As aircrews we can also do our share in preventing dropped objects, especially those due to personnel error. First, we must conduct thorough exterior preflights. This is especially true away from home station at non-MAC enroute stops. Not only inspecting the aircraft, but actually physically checking the security of panels, single point refueling caps, etc., will help us detect a "dropped object waiting to happen."

If prevention fails, however, and something departs your aircraft inflight, write it up in the Form 781A and debrief it to maintenance at the first MAC station transitted. Also fill out a MAC Form 97 and let the folks at the local command post know. They have required reports to transmit, as well.

As we've seen, over half of MAC's 1983 dropped objects were due to materiel failure and the key to correcting these materiel failures is to identify them. Materiel deficiency reports and quality deficiency reports should be submitted by the maintenance folks to the appropriate air logistics center. But remember, crewmembers can also initiate changes to technical orders, identify materiel problem areas, and make suggestions to correct known materiel deficiencies.

As you can see, MAC needs your help to reduce the number of dropped objects in 1984. And with your assistance, perhaps one day we'll be able to truthfully say that dropped objects are a thing of the past. That's a goal worth pursuing.

were on a routine training mission in an HH-3E and had just completed a refueling stop at McGuire AFB, New Jersey. With weather reported at 400 feet and 1 mile visibility due to fog and haze, the crew made a normal departure for their return flight to Suffolk County ANGB, New York.

Approximately 10 miles southwest of McGuire as the helicopter was climbing through 3,000 feet, TSgt. Henry Aprea, the flight engineer, reported the number 2 torque had dropped to zero. He then went aft to investigate and discovered a very large main transmission oil leak spewing oil into the cabin and out the right side of the aircraft.

Major Ingram quickly declared an emergency with approach control and requested vectors back to McGuire. Approximately 4 minutes later, Sergeant Aprea advised him the number 1 torque had dropped to 30 percent, the transmission oil-pressure warning light had illuminated and the transmission pressure was zero. Faced with the prospect of an autorotation at any moment, Major Ingram decided to continue back to McGuire because of the fog and low ceilings obscuring ground obstacles in their area.

During the recovery, the crew's problems continued to multiply. When directed to switch to a UHF frequency due to congestion on VHF, 1st Lt. Robert Landsiedel, the copilot, discovered that the HH-3's UHF was inoperative. It took him several minutes to reestablish communications with approach on VHF.

At approximately 3 miles out on approach, the situation deteriorated further when the helicopter's engine torque became erratic and an autorotation seemed imminent. Descending through 250 feet AGL, Lieutenant Landsiedel spotted the runway and Major Ingram quickly maneuvered the HH-3 to a safe landing.

Left to right: TSgt. Henry A. Aprea, FE; 1st Lt. Robert S. Landsiedel, CP; Maj. Martin J. Ingram, AC.

Initial investigation of the cause of the oil leak revealed a cracked fitting at the main transmission. The severity of the oil leak was confirmed when maintenance technicians measured the quantity of oil left in the main transmission. At the time of landing, only 1.5 quarts of oil remained out of a total capacity of 11.5 gallons.

Major Ingram and crew's professional and timely reactions to a critical inflight emergency compounded by bad weather and intermittent communications clearly qualify them for the "Excellence in Airmanship" award. Congratulations from *TMF*.

There Really is a... TERPs

Sitting around the squadron one day a few years ago, someone asked why all those missed approach procedures we practiced were so complicated. "Whoever designs those things obviously has a two-headed coin," he continued somewhat sarcastically. But that's absolutely *wrong*.

Instrument approach procedures, approach minimums and missed approach procedures are based on a set of standards published by the FAA. That book is commonly known as the TERPs manual, an abbreviated moniker for the *United States Standard for Terminal Instrument Procedures*, and available to the USAF as AFM 55-9.

The FAA uses TERPs criteria to design instrument approach procedures (IAPs) and establish all the numbers on instrument approach charts for civilian airfields. The same criteria are used in the design of IAPs at U.S. military airfields in areas where the U.S. generally controls the airspace. (Remember that ICAO rules may have some differences in areas outside FAA jurisdiction. TERPs applies to FAA areas and all U.S. military airfields in those areas. Host nations' designs may differ.) A *basic* familiarity with TERPs is important since what you don't know *can* hurt your airplane, or worse still, you and your crew. Here are some examples of obstacle clearances provided when arriving and departing under instrument conditions.

Nonprecision Approaches

By definition, a nonprecision approach procedure is one with no electronic glideslope information. The amount of vertical and horizontal clearance along an instrument approach course varies with the type of approach. For example, the obstacle clearance criteria for a VOR approach with a final approach fix differ from those specified for the same type of NDB approach. The table lists the minimum obstacle clearance at MDA for different nonprecision approaches. Increasing obstacle clearance may be necessary for:

a. Procedures designed for use in areas characterized by steep terrain;

b. Procedures using a remote altimeter source; or

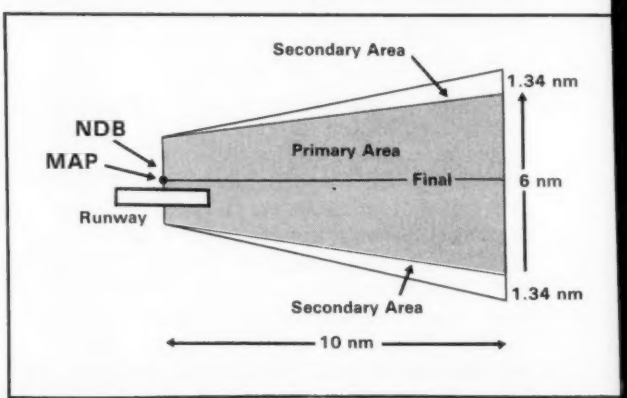
c. Procedures using a final approach fix and the distance from the FAF to the nearest landing surface exceeds six miles.

The diagram below is an example of how the final approach segment obstacle clearance area is established for a low altitude straight-in NDB approach.

As you can see, primary and secondary areas are established on either side of the approach course. At a point 10 nm from the NDB, the primary area is six nm wide (three nm either side of centerline) tapering to a width of 2.5 nm at the NDB. For this particular type of approach, an obstacle clearance of 350 feet is provided within the primary area.

The secondary area is harder to visualize. The obstacle clearance in that area is 350 feet near the edge of the primary area and tapers uniformly to zero at the outer edge.

Obviously, it would be difficult to determine your position in relation to the primary



Primary and secondary obstacle clearance areas for final segment of NDB approach with NDB on airport.

and secondary areas while flying this approach. There is no practical way of knowing

Type of Approach	Minimum Obstacle Clearance
Localizer	250′
VOR/DME,TACAN, & VOR with FAF*	250′
ASR**	250′
VOR on airport (no FAF)	300′
NDB with FAF	300′
NDB on airport (no FAF)	350′
DF approach	500′

*Final approach fix
**Airport surveillance radar

when you are outside the obstacle clearance areas. Therefore, to insure adequate obstacle clearance at MDA, you should remain as close as possible to the approach course centerline. Generally speaking, to provide an equivalent level of safety for different types of approaches, the amount of obstacle clearance at MDA increases as final approach course precision decreases.

One final caution. Be careful about making an early descent below MDA when transitioning for landing. A descent below MDA before being in position to descend for a normal landing will put you below the obstacle clearance criteria, and also set you up for that dreaded short landing!

But even if you stay at the MDA until reaching the VDP or intercepting the VASI glideslope, you aren't home free! Far too many accidents result from pilots "ducking under" the glideslope prior to reaching the touchdown zone. (See "Ducking Under," January 84 *TMF*.)

Precision Approaches

A precision approach procedure (ILS or PAR), provides an electronic glideslope. The final approach course is normally aligned with the runway centerline, and the area considered for obstacle clearance in the final approach segment consists of a final approach area and transitional surfaces.

Obstacle clearance is based upon two areas. The first area begins 975 feet outward from the ground point of intercept (GPI), extends to a 10,000-foot point and is called the inner section. The outer area then extends another 40,000 feet.

The slope ratios of the inner and outer sections vary depending on the glideslope angle. The selected precision glideslope angle is determined by the lowest angle providing no obstacle penetration. The optimum angle for a military ILS is $2\frac{1}{2}°$.

The transitional surfaces (secondary areas) are inclined planes with a slope of 7:1 which extend outward and upward from the edge of the final approach area. Their surface heights are the same as the final approach surface at the near edge, and increase one foot for every seven feet you move outward toward the obstacle.

The category II ILS meets the above obstacle clearance criteria and also ensures that no obstacles penetrate the approach light area, the touchdown area, the touchdown area transitional surfaces, and the missed approach area. Obstructions in these areas must be eliminated or controlled, such as with traffic lights on a perimeter road. Criteria for Cat II ILSs and airborne radar approaches are contained in AFR 60-27.

Circling Approaches

Even some experienced pilots cringe at the thought of flying circling approaches, and with good reason. These approaches must be flown visually, at low altitudes, and often in marginal weather conditions. Although obstacle clearance is provided, the margin for error is slim.

Circling area size is dictated by the category of aircraft using the procedure. Obsta-

Radii (r), defining the size of the areas, vary with the aircraft category.

Aircraft Category	Obstruction Clearance Radius
A	1.3 nm
B	1.5 nm
C	1.7 nm
D	2.3 nm
E	4.5 nm

Circling approach radii.

cle clearance areas are established by drawing arcs from the runway ends using the distances shown in the table.

If minimum obstacle clearance can't be established within these distances, the individual category of aircraft is prohibited from making a circling approach to that airport. At certain airports, circling approaches are prohibited for any aircraft in quadrants where minimum obstacle clearance can't be assured. Circle-to-land minimums provide at least 300 feet of obstacle clearance in the circling area. No secondary obstacle clearance areas are established for circling approaches, so wandering out too far can lead to trouble.

Missed Approach Procedures

Obstacle clearance after passing the MAP is based on a climb gradient of 152 feet per nautical mile, unless a higher rate is noted on the approach plate. (Copter procedures require 304 feet/nm.) The missed approach also has primary and secondary obstacle clearance areas. Once again, however, it's difficult to determine where you are within those areas while flying. Therefore, the prudent pilot will remain as close as possible to the missed approach procedure track.

If a missed approach procedure requires a turn, the area is calculated in much the same manner as for a circling approach. Its size is based on the highest category aircraft that will use the approach procedure, but the distances specified are greater than circling approach areas to allow a greater margin of error. There is also no secondary area unless positive course guidance is provided.

We've discussed obstacle clearance during the final approach course of an approach procedure and during a missed approach, but what happens if it becomes necessary to make a missed approach prior to reaching the MAP?

TERPs doesn't provide obstacle protection in the event you execute a missed approach **before** reaching the MAP. Therefore, when executing a missed approach, unless otherwise instructed by ATC, you should continue to fly the published approach procedure, (either complying with all altitude restrictions, leveling off or descending to the MDA/DH as appropriate), and at the MAP, fly the missed approach procedure.

Here's just one last thing to remember, and it comes straight from AFM 51-37. If the decision to execute the missed approach is delayed beyond the MAP, you may be below the missed approach obstacle clearance area.

If you lose visual reference while circling, follow the missed approach specified for the approach procedure just flown, unless otherwise directed. An initial climbing turn toward the runway will assure the aircraft remains within the circling obstruction clearance area. Continue to turn until established on the published missed approach course, and then start an immediate climb to ensure meeting the climb gradient requirements.

Summary

The preceding examples present only a fraction of the information from the TERPs manual used to establish the procedures for instrument flying. A review of TERPs is highly enlightening. It makes IAPs mean more than just lines and numbers on a chart. After reading it, you'll know how much obstacle clearance is provided inside the final approach fix and during the circle-to-land maneuver. You'll also be a better instrument pilot!

—Courtesy of AOPA Air Safety Foundation and HQ MAC/DCF

Mishap With A Moral

Midair collisions can happen even when the weather is...

The concept of "see and avoid" is a simple one. But as the aviation environment becomes more crowded with smaller, faster aircraft, the practical application of this fundamental doctrine becomes increasingly difficult. Advances in aircraft speed and maneuverability have created a natural, but potentially deadly tendency to rely on technological "eyes" to provide an envelope of safety around our aircraft in flight. On 6 February 1980, a civilian Cessna TU-206G pilot and a General Dynamics F-111D crew confronted the nightmare aviators fear when the weather is "clear and a million."

The winter morning was crisp as the company president landed his Cessna at Tucumcari, New Mexico, airport. He was on a business trip with an associate, and had stopped enroute from Albuquerque to Clovis. While at Tucumcari, the pilot received a weather briefing and information on the jet aircraft traffic in the Clovis vicinity. The weather for his destination was good, with an estimated 8,000-foot broken ceiling and 30 miles visibility. The pilot filed a visual flight rules (VFR) flight plan with Tucumcari Flight Service Station (FSS), proposing a 7,500 foot cruising altitude and a 125-knot true airspeed. The flight plan indicated the Cessna was equipped with an emergency locator transmitter (ELT) and a multi-channel transponder without an altitude encoder.

The proposed route of flight would take the small aircraft across the approach corridor to runway 21 at Cannon AFB, New Mexico. Cannon, located 13 miles southwest of Clovis, is the home of the 27th Tactical Fighter Wing and their F-111D fighter aircraft. The base has a radar approach control center (RAPCON) which provides air traffic advisory service to all pilots who request it when arriving, departing or transitting the Clovis area.

Prior to takeoff, the Cessna's pilot set the multichannel transponder to code 1200, indicating VFR flight. At approximately 1007 local, the company president and his passenger departed Tucumcari on their 53 nautical mile journey. About 19 minutes later, the Tucumcari FSS operator heard a radio call from the Cessna, but could not establish two-way radio contact. He heard no further radio transmission from the light aircraft.

As the Cessna was taking off, Leggs 45, an F-111D, was returning home to Cannon AFB after a cross-country training mission. The Albuquerque Air Route Traffic Control Center (ARTCC) cleared the F-111 to descend to 16,000 feet and proceed direct to Curry intersection, a point 10 miles from the Cannon TACAN on the 028° radial. When the fighter was approximately 40 miles northwest of Cannon, the RAPCON approach controller established positive radar identification and asked what type of approach the pilot desired. The aircraft commander requested a high TACAN runway 21 penetration and an airborne instrument landing approach (AILA). This procedure gives the pilot the capablity to perform an approach to a programmed landing site in low visibility conditions.

Leggs 45 was then cleared to hold northwest of Curry intersection and to descend to 14,000 feet. About seven minutes later, at 1017, the crew was told to expect a turn in holding and to descend to 12,000 feet. At 1019, the F-111 was cleared for a high TACAN runway 21 approach, allowing the pilot to descend at his discretion to 5,800 feet between 24 and 10 miles from the Cannon TACAN. At 1024, the RAPCON approach controller transferred air traffic control of Leggs 45 to the arrival controller, a trainee performing under the supervision of a fully qualified controller. At this time, the jet was inbound about 23 miles from the landing runway. The arrival controllers observed the primary and secondary radar returns of the F-111 on the radar scope. At 1026, the F-111 disappeared from the radar scope and an emergency locator transmitter was heard in Cannon AFB tower. The experienced controller watched the primary radar return for about one more mile before it, too, disappeared. The F-111 and the Cessna TU-206G had collided, killing the occupants of both aircraft.

At 1026, the F-111D disappeared from the radar scope and an emergency locator transmitter was heard in the Cannon AFB tower.

ANALYSIS

The investigation of this midair collision began with identifying the qualifications of the personnel involved. The National Transportation Safety Board (NTSB) investigators determined all crewmembers, military and civilian, were properly certificated to operate their aircraft. Also, all air traffic controllers except the trainee, who was performing under supervision, were fully rated under USAF and FAA authority. Next, the airframes were examined in detail. The investigators also concluded that neither aircraft had incurred any inflight mechanical problems or structural failure prior to the collision.

Careful examination of the impact sites and wreckage revealed the collision angles of the two aircraft. The initial contact was between the F-111's right bomb rack and the Cessna's left wing tip. Both aircraft were in

level flight just prior to the collision. Analysis of the Albuquerque ATC radar track and interpolation of instrument readings indicated the F-111 was flying between 300 and 340 knots indicated airspeed (KIAS). The Cessna was flying at 125 KIAS. The calculated closure rate was approximately 370 knots, or 625 feet per second.

Since the Cessna made a radio call just before the collision, the investigators concluded the Cessna pilot had no communications difficulties and had the ability to contact the RAPCON facility, although this call was not required. The safety board felt that if the pilot had been in radio contact with the RAPCON facility, timely traffic advisories may have prevented the mishap.

The military pilot was required by USAF directives to obtain approval for the AILA and to request separation from other traffic by the air traffic controller prior to commencing the approach. Although the aircraft commander obtained proper approval for the approach, he failed to request traffic separation. The safety investigators felt such a request might have alerted the RAPCON controllers, who then may have observed the radar returns from the Cessna.

The board also paid special attention to the reason the controller failed to see the Cessna's primary or secondary radar returns. They visited the RAPCON facility and checked the operational capability of the equipment. All components functioned properly. Since the Albuquerque ARTCC radar antenna received and recorded the code 1200 beacon response from the Cessna up until the time of the collision, the NTSB investigators concluded the primary and secondary returns were displayed on the RAPCON radar scope. The board was unable to determine positively why the controllers did not or could not observe the returns. Although this oversight compromised the safety margin built into flight operations, it was only part of the problem.

Military directives and FAA rules specify that each person operating an aircraft under visual or instrument flight rules and regardless of aircraft type, will see and avoid other aircraft. In this accident, there were factors which complicated this responsibility to see and avoid. The F-111 was performing an AILA approach which demands attention to cockpit instruments and computers. This would certainly distract the crewmembers. However, the prescribing directive stated the see and avoid policy is mandatory and the aircraft's flight path shall be visually cleared by at least one crewmember at all times.

An analysis of the collision geometry showed that during the last 105 seconds, or from the point when the aircraft separation was about 10 miles, the F-111 would have been completely hidden from the Cessna pilot because of aircraft position and the high wing of the Cessna. The NTSB concluded that the Cessna pilot could not have reasonably been expected to see and avoid the F-111. Further, reasonable head and body movement by the pilot of the F-111 would not have placed the Cessna within his field of view. However, similar movement by the weapons system operator (WSO) would have enabled him to see the Cessna.

PROBABLE CAUSE

The NTSB determined the probable cause of this mishap to be threefold: (1) The failure of both aircraft to request radar traffic advisories; (2) the failure of the F-111 flight crew to see and avoid the Cessna; and (3) the failure of the RAPCON controllers to observe the Cessna radar target and to issue traffic advisories to the F-111. In presenting these causes, the board also noted the limitations of the see and avoid concept in a terminal area with low speed/high speed traffic as a significant contributing factor.

APPLICATION TO MAC

The majority of our flights, regardless of actual weather conditions, are conducted on IFR plans. The tendency to rely on radar to keep us clear of other traffic is real and could be catastrophic. Ironically, we are usually more vigilant in scanning for other aircraft in inclement weather than in visual meteorological conditions. Yet when the weather is clear, there is a much greater volume of VFR traffic with the associated increased risk of collision. We need to stay on guard for other traffic even after radar contact has been established. The "big sky, little aircraft" theory of aircraft separation has been disproven far too many times already!

—Adapted from NTSB AAR 82-10

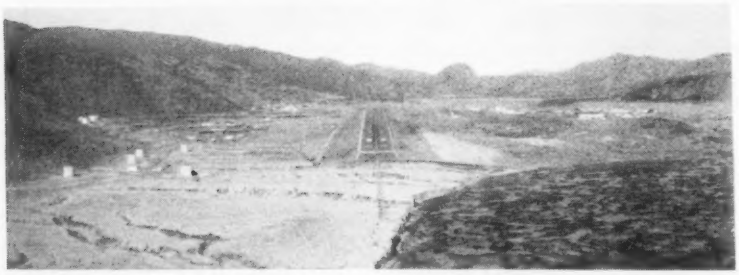
Deja Vu

Sondrestrom AB, Greenland

(elevation: 165 feet)

Lonely and desolate, Sondrestrom Air Base is just 10 miles from the southwestern edge of the Greenland ice cap and at the end of a 100 mile-long fjord. Approaches to the single runway (10/28) are aligned with the fjord because of high terrain in all quadrants.

The crest of the upslope of runway 10 is about 3,500 feet from the approach end, or about even with the first taxiway to the right.



Short final to runway 10. Airfield complex is to the right.

Short final for runway 28. Note the 150-foot bluff just prior to the approach end.

The highest point within 25 miles is a mountain, 3,553 feet MSL, 22 miles south of the field. The terrain averages 2,000 feet elevation on both sides of the final approach course.

Sondrestrom's runway is 9,235 feet long and 200 feet wide. The overall slope for runway 10 is 0.7 percent up. However, there is a sharp rise in the first 3,000 feet of the runway (1.58 percent up). The PAR glide slope is 3° which, when coupled with the inital 1.58 percent upslope, may cause a visual illusion and lead to large attitude changes on short final and throughout the flare. This upslope can also cause an illusion of running out of runway at touchdown.

Some turbulence and wind shear can be expected between 4,000 and 2,000 feet during most approaches. Aircrews can expect moderate turbulence on final approach when winds are in excess of 20 knots. Night operations offer no ground visual references except in the immediate vicinity of the airport.

Sondrestrom's approaches include high and low TACAN, NDB, PAR, ASR and circling.

Certification is required for MAC aircrews prior to flying into this far-northern outpost. Aircrews should also consult the 21st Air Force summary of airfield restrictions and operating procedures for current information.

—Adapted from AQP 39533

NOTICE
The squadron has been selected to participate in a test of the new Air Force physical fitness standards. The test will take place on 1 May 1984, at 0900, at the base track and will include a mile and a half run and situps. Personnel will be excused from this test only by written permission from competent medical authority. This is a *mandatory* formation.
CLICK

The Flabby Flyboy flunks physical fitness

The Anaerobic Aeronaut reread the heavy-handed notice, shrugged his shoulders and smirked at Sammy, his able second-in-command. "Who cares, Sammy m'lad. I'll just get my friendly flight surgeon and neighbor, Dr. Randy 'I.V.' Protest, to prepare me a suitable excuse. Besides, Sammy, you just can't waste the valuable time of an ace aviator like yours truly with all that exercise stuff. You know, I've never been in better shape."

Long Suffering Sam surveyed the Paunchy Pilot's ample midrift bulge and multiple chins, and started to protest. "But Boss, I thought the testing was a mandatory formation. Besides, it sure looks like you could use some phys..." Sammy's accurate analysis of C.R.'s deplorable physical condition was cut off by a bellow from the ops officer's cubicle.

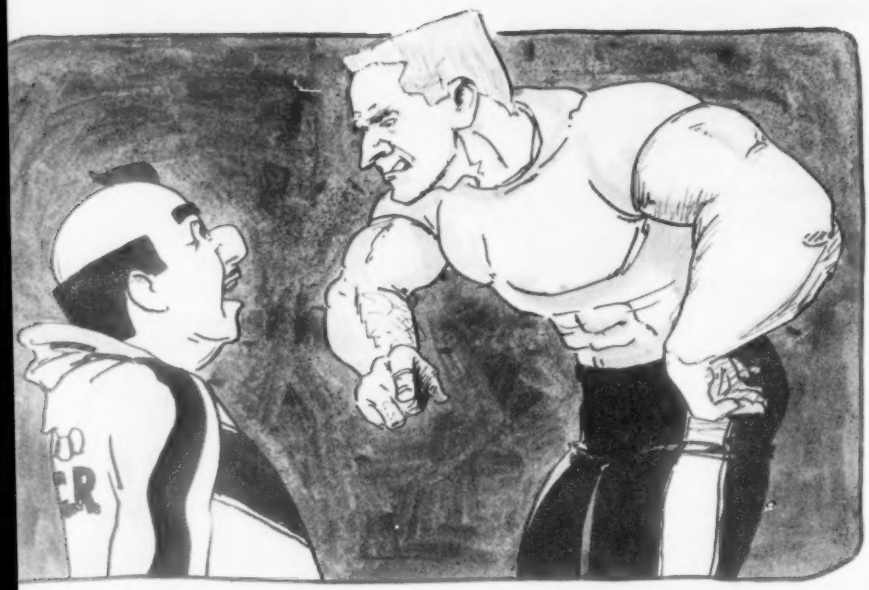
"Terror, get in here! Pronto!" Col. Bill "Bull Moose" Bushwhacker was excited and everyone in the building knew it—instantly!

Sucking in his ample avoirdupois, C.R. knocked on the door and saluted. "You bello...er, called, sir?"

The "Bull" stood up to his full six-foot, six-inch height and flexed his massive forearms. "Terror, it's come to my attention that you've *never* participated in the annual physical fitness testing. Something about a bad back, I think. Well, I just got off the phone with the chief flight surgeon and he says your medical records indicate you've never had a back problem in your life. Congratulations on your miraculous recovery!" His voice literally dripped with sarcasm.

"But that's not the main reason I called you in here. Although I've only been in the squadron for a month, I noticed you need some shaping up the very minute I walked in. With those sloped shoulders and that disgusting paunch, you resemble a nomex-covered, pot-bellied stove. Since you are easily the most physically unfit individual I've ever met, I've decided to *personally* supervise your getting into shape. Major, this is a direct order. Get your sweat clothes and meet me at the gym at 1630 sharp. We'll start your workouts today!"

"But...but sir!" the Pudgy Pilot was near collapse from the shock. "I...er... have a



local at 1500 today and I have to get my two and two or I'll go noncurrent." C.R. was quickly regaining his wits and the old time-tested excuses were once again flashing though his mind.

"Nice try, Terror," the Bull roared, "but no dice! I thought you'd come up with some world-class excuses, so I've done a little precoordination. As of this instant, you are hereby relieved of all duties, additional and otherwise, and assigned to me for physical conditioning—and that's for eight hours a day. Got it?" The colonel was new, but obviously several jumps ahead of MAC's Most Flabby Flyboy.

Undaunted, C.R. reversed his field and tried another approach. "Well, uh, great, sir. I'll sure be there at 1630. But since I'm already in pretty good condition, I don't think I'll need more than a couple of hours of work to get in tip-top shape."

"Terror, we've only got three weeks before the physical fitness test to whip you into shape. But from the looks of you, it will probably require three months for you to qualify as even semi-fit. No matter, though. By 1 May I personally guarantee you'll pass the fitness test. Now go get your stuff!"

Realizing the utter futility of continuing the losing argument with the broad shouldered colonel, C.R. saluted limply and departed in gloom.

It was close to 1645 when C.R. parked his rusty, green E-type Jag in the gym's parking lot and headed for the door. "Drat! Why'd I get drafted into the physical fitness corps. The Bull ought to know that I get all the conditioning I need what with the bag drags and high energy crew resting whilst out in the system." His mutterings complete, he pulled open the gym door and sadly stepped inside.

"Terror, you're 15 minutes late! That'll cost you 15 extra situps, 15 leg raises, 15 pushups and 15 laps around the gym. When I say 1630, major, I *mean* 1630. Now get busy with your jogging while I get limbered up." The colonel's rippling muscles drove all thoughts of protest from the Puny Pilot's head.

An hour later, C.R. was sweat-soaked, red-faced and exhausted. "Uh, sir, how about a water break and we hit the showers? No need to overtax ourselves on the first day, ya know." His hopeful plea for mercy was lost on the Bull.

"Nonsense, Terror. I've been keeping count, and you still owe me 10 laps. We'll get to the rest of the exercises later. Now get moving so we can start our workout."

Too tired to argue, the Ace of Aerobics stumbled to his feet and shuffled off on his rounds of the basketball court. "That sadist is going to kill me. This has got to be a bad dream." C.R. pinched his forearm to confirm his hope that this wasn't happening. He was quickly rewarded with an angry red welt for his efforts. "Ouch!" he yelped as he confirmed his threshold of pain was at its normal low level.

"OK, OK. That's enough leisurely jogging for now, Terror," C.R.'s muscular mentor interrupted as he pointed to a nearby incline board. "Hop on the board and give me 15 quick situps, major. Time to give those abdominal muscles a little work since it's obvious they need it."

C.R. groaned, audibly this time, and limped over to the board which rested at approximately a 45° angle. "Isn't

that a trifle steep, sir?" he whined. "I thought maybe I could start off with the board flat on the floor." Seeing the immediate scowl on the Bull's face, C.R. quickly continued. "Well, of course if that's what you recommend, sir, it'll be fine with me. You did say five situps. Right, sir?"

"What I said, Terror, was 15. You got that? Now quit stalling and start exercising!"

The first three situps actually were fairly easy for the Sedentary Sultan. But it went downhill from there—rapidly. After the fifth, C.R. knew something was definitely wrong. He'd felt pain before, but nothing like the white-hot flashes that seared through his overtaxed and underused abdominal muscles.

The Bull surveyed the Wounded Weakling disgustedly. "That's only five situps, major. I said 15. Get busy or I'll add on another 15!" The colonel obviously meant business.

C.R. gulped in a breath of fresh air and lunged upwards, determined to complete the 15 situps, the first he'd ever attempted. As his quivering elbows neared his shuddering knees, it happened. *"ARGHHHH!"* The scream was so loud and so agonized that all activity in the gym stopped as heads turned towards the exercise room.

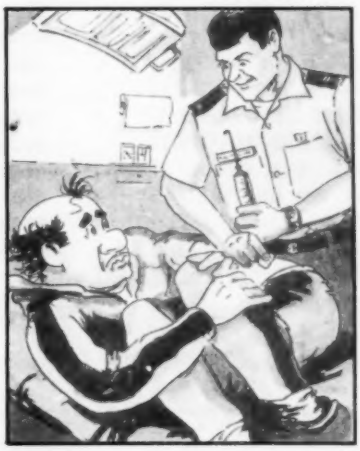
"Got a problem, C.R.?" the colonel asked casually, not realizing what was happening with his pupil. "By the way, that's a real good situp. Got your chest right up there against your knees. Now give me another nine just like that and we'll call it a day."

But C.R. didn't move. He *couldn't* move. All he could do was moan. Finally, he managed to croak, just loud enough for the Bull to hear. *"Cramp!"*

"What's that, C.R.?" the colonel asked, now a little concerned. "Did you say you have a cramp? Better rest a bit. Just relax and lie back on the board. You'll feel better in a minute."

But try as he could, the Knotted Neophyte couldn't lie back. "Can't...move. Muscles...cramped. Call... doctor...quick!"

Suddenly the Bull understood. "Call an ambulance," he bellowed to the worried

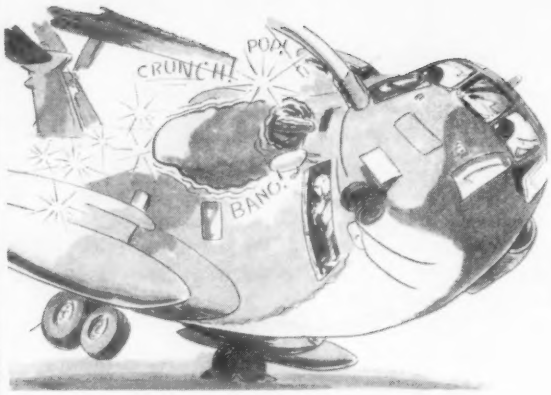


gym attendant who had been attracted by C.R.'s earlier scream of agony. "Tell them we'll need a doctor and a couple of strong corpsmen." Turning back to C.R., the Bull effortlessly lifted him from the incline board and freed his feet, receiving a weak moan of thanks in return. The Bull carefully laid the Wounded Warrier on the mat and was astounded to see C.R. remain tightly curled up in a ball, chest firmly locked against his knees. "Looks like you might have a little muscle cramp there, Terror, but don't worry. The medics are on the way and will have you straightened out in no time."

It was only minutes later that C.R. was wheeled into the hospital emergency room and a young doctor took charge. "C.R., what happened?" Unable to speak for the pain racking his body, the Pained Pilot rolled his eyes and groaned as his neighbor Dr. Protest began the "poke and prod" routine.

"Nothing to worry about, C.R.," the young flight surgeon finally remarked. "Somehow you've managed to pull every muscle between your neck and your toes and they all seem to have cramped at once. We'll give you a shot of muscle relaxant and admit you to the hospital for a week and you'll be just fine. Although you may be a bit sore for a month or so, you should be able to resume your workouts with Colonel Bushwhacker in about six weeks. Too bad, though, you'll have to miss the aerobic test on 1 May. By the way," Protest injected, "the colonel says he's scheduled you for an individual physical fitness test on 2 July, and you're going to be in shape to qualify at level-5. You've got a great coach there, C.R."

Despite the unbearable pain of pulled muscles and a dull four-inch needle perforating his hip, C.R. Terror, Exercisor Extraordinaire, shook his head and then broke out into a groaning laugh. He'd finally met his match. This year, for the first time in his career, C.R. would *have* to run aerobics. ★



Jolly Bad Show

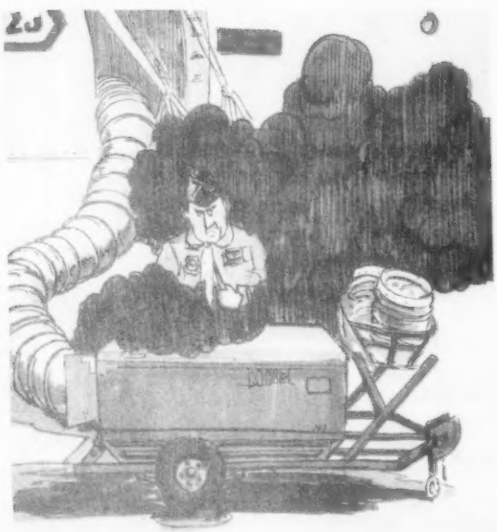
The HH-53 was scheduled for maintenance engine runs and a qualified crew was at the controls. During the first engine start, number two would not light off so the start attempt was aborted. Following a check of all switches and circuit breakers and motoring to purge fuel, the crew attempted a restart. The second try was successful and the number two engine operated normally, with the exception of torque indications which didn't register properly until the engine power was advanced above idle. Moments later, with number one at full forward and number two at 100 percent NF, the number two engine instruments began to fluctuate wildly. The crew shut down the engine and ground personnel reported sparks coming from the number two exhaust, accompanied by strange noises from the engine.

Maintenance removed the ailing engine and found extensive damage, apparently caused by FOD. They X-rayed the engine's EAPS (engine air particle separator) and discovered numerous rivets and washers between the inner and outer walls of the EAPS. It seems the EAPS had recently undergone sheet metal repairs to replace a torn seal and had not had an X-ray NDI (nondestructive inspection) due to misinterpretation of the tech order guidance. The cost of this misinterpretation was $28,584!

Fire and Ice

It was a cold and windy day, and maintenance had positioned a BT-400 heater near the C-5's crew entrance ladder. Suddenly, the maintenance crew noticed flames coming from the heater and alertly attempted to extinguish the blazing heater with a nearby wheeled, 10-gallon CB fire extinguisher. The hose charged properly, but the agent wouldn't spray on the fire. Luckily, the fire was quickly smothered with other fire extinquishers, preventing damage to either aircraft or heater.

An investigation of the inoperative fire extinguisher revealed that water had entered the hoze and frozen, blocking the flow of the CB agent. The hose had been stored with the nozzle up, a procedure permitted by the appropriate tech order. This allowed water to enter the hose and freeze in the near-zero temperatures. Needless to say, this unit now ensures its fire extinguisher hoses are stored nozzle-down.

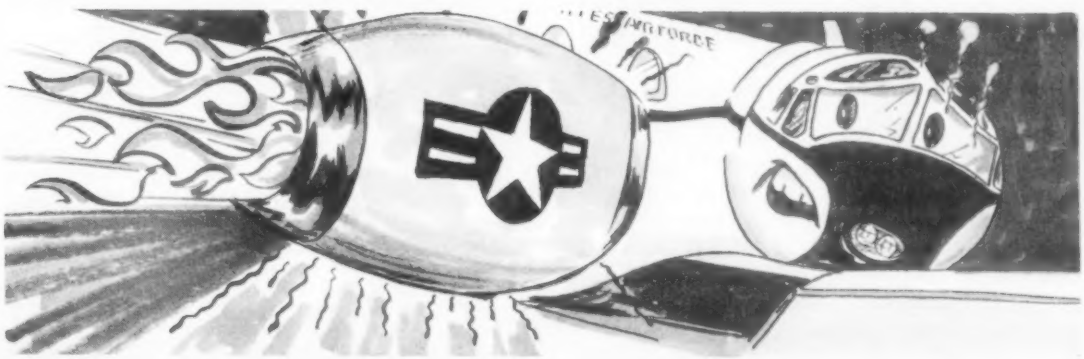


Cargo Compartment Roundup

A recent HC-130 airdrop incident resulted in minor rope burns on the neck of an instructor loadmaster—but the incident *could* have caused a serious injury or fatality. It seems the instructor LM was receiving an annual qualification evaluation and was performing manual delivery of a simulated MA-1 kit. He had just deployed the number one bundle and initiated the deployment of number two when the 10-foot line broke away from the number one bundle. The line then whipped back into the aircraft, wrapping itself one-half turn around the surprised loadmaster's neck. As the bundles continued out of the aircraft, the rope tightened and pulled the loadmaster to the floor. Luckily, the flight examiner acted quickly and cut the rope, freeing both the loadmaster and the bundles. After landing, the loadmaster was treated for some minor rope burns and returned to duty.

Sabreliner Afterburner

The unsuspecting CT-39 crew was on departure roll and had just disengaged nosewheel steering when they heard the number two engine surge. Simultaneously, the number two fire light illuminated, so the crew aborted the takeoff, taxied clear of the runway and egressed the aircraft. Faulty fire light? Hardly! A fuel leak caused by the use of an unauthorized O-ring seal resulted in a fire which burned through the combustion section.



Ms Moose Missed (and baby, too.)

The brand-new C-130H was on a night VFR training mission practicing night heavyweight assault landings along with some normal touch and goes. The Herk had just touched down and was accelerating for takeoff when the IP in the right seat looked up and saw two moose (mooses?) on the runway ahead of them. The cow and her calf were crossing the runway from left to right, some 200 to 400 feet in front of the Herk and were aligned between the numbers one and two engines. Since the aircraft was already at rotation speed, the IP took control, rotated and applied power, narrowly missing the animals. The moose escaped unharmed, but the Herk was not so fortunate. The IP's rapid power application resulted in torque readings in excess of 23,000 inch pounds for an estimated two to three seconds, overtorquing all four engines.

Unfazed by the close encounter with the C-130, the moose remained in the runway vicinity until a base ops vehicle arrived to herd them away.

Backwards Trim

The four-engine generic airlifter was approaching the end of the runway and the pilots were hurrying through the checklists in an attempt to make an on-time departure. But all thoughts of departure ended abruptly when the alert copilot checked the pitch trim and noticed the pitch trim indicator was moving exactly opposite from the way it should have. Maintenance traced the problem to a faulty actuator that had been manufactured with the wiring for two cannon plugs reversed. Luckily, a sharp copilot noticed the discrepancy before flight. But what happened during the maintenance ops checks and the flight engineers' power-on preflight? Complacency, inattention, inexperience? Perhaps!

Notable Quote

A good aircraft commander shares decisions with others, even though he or she alone must accept the final responsibility for the results.

Adapted from TWA *Flight Facts*

After Deadlines

A TRAGIC BEGINNING FOR 1984—January and February were tragic months for this command. On 9 January, a UH-1N from the 1 SOW ditched at night near Nassau, the Bahamas. Of the nine persons on board, only four survived. Then on 28 February, a C-130 from the 435 TAW crashed near Zaragoza, Spain, during a night All Weather Aerial Delivery System (AWADS) training mission. All 18 on board, including a Spanish Air Force officer, were killed.

MAC MEMBERS' RESPONSES TO THE IG's "SAFETY ROAD SHOW" were enthusiastic and welcomed. Thanks to everyone out there who took the time to attend these "state of the command's safety program" briefings. There were many good questions and inputs from all of you, and these are now being reviewed. Comments on them will be sent back to the field as soon as all of the safety-related inquiries are answered. Remember, communication is a key to effective mishap prevention and safety awareness, and all of your comments are important. Keep in touch.

STAFF CHANGE AT *TMF*—Captain Gene Clouse, an associate editor at *TMF* for the past 2½ years, left recently for a new assignment to Geilenkirchen, Germany. Gene will be assuming new duties as an emergency actions officer in the NATO command post there. We at *TMF* wish Gene good luck in his new job.

EDSA WINNER ANNOUNCED—Headquarters MAC Plans has announced that the Shorts Sherpa, a version of the Shorts SD-330 commuter aircraft, will be the European Distribution System Aircraft (EDSA). Designed to fill the requirements for a short-haul, off-the-shelf airplane for the forward-based logistics system, the aircraft will be known as the C-23, and will be based at Zweibrucken, Germany, with the newly formed 10th Military Airlift Squadron. The C-23 is built by Shorts Brothers, Ltd., of Belfast, Northern Ireland, and should reach its initial operational capability (IOC) by spring 1985. First aircraft are scheduled to arrive at Zweibrucken sometime this fall. Initial operational and maintenance cadre will start arriving at Zweibrucken this summer, and Shorts Brothers will conduct the initial training of the aircrews and maintenance people. In addition, Shorts will provide contractor-operated and maintained base supply (COMBS), as well as "off-equipment" maintenance, including heavy inspections. TMF will publish an in-depth look at MAC's newest airlifter in a later issue.

C-21A ROLLOUT—MAC's new operational support airlifter, the C-21A Learjet 35, was rolled out from the Gates Learjet headquarters in Tucson, Arizona, on 13 March. Part of a dual aircraft lease along with the Beechcraft C-12F, the C-21A and its turboprop stablemate will replace MAC's aging fleet of CT-39s in providing safe, efficient and economical support airlift for many years in the future. Pictured here is C-21A No. 1.

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